

What is claimed:

1 1. A reinforced semiconductor interconnect structure,
2 comprising:

3 A first metal interconnect disposed in a first
4 material, the first metal interconnect having a line portion
5 and at least one via portion, an anode section and a
6 cathode section, the via portion of the first metal
7 interconnect located in the anode section, the line portion
8 of the first metal interconnect having a top, bottom and
9 terminus side, wherein at least a part of the bottom side of
10 the line portion of the first metal interconnect in contact
11 with the first dielectric;

12 a first reinforcement disposed in the first material,
13 the first reinforcement in contact with at least the bottom
14 side of the first metal interconnect, the first
15 reinforcement comprising a second material, the second
16 material being electrically nonconductive; and wherein the
17 second material has a greater mechanical rigidity than the
18 first material.

1 2. The structure of claim 1 wherein the first material
2 is a low dielectric constant material, having a dielectric
3 constant of at most about 4.3.

1 3. The structure of claim 1 wherein the second
2 material is a high dielectric constant material.

1 4. The structure of claim 1 wherein the line portion
2 of the first metal interconnect is in contact with the
3 reinforcement.

1 5. The structure of claim 1 wherein the first
2 reinforcement is in contact with the via portion of the
3 first interconnect.

1 6. The structure of claim 1 further comprising a
2 second metal interconnect disposed in a fifth material, the
3 metal interconnect having a line portion and a via portion,
4 the line portion having a top and bottom side, wherein at
5 least a part of the top side of the line portion of the
6 second metal interconnect is in contact with the first
7 material and wherein the via portion of the first metal
8 interconnect is in electrical contact with the second metal
9 interconnect.

1 7. The structure of claim 6 further comprising a
2 second reinforcement disposed in a third material, the
3 second reinforcement in contact with the first metal
4 interconnect and wherein the second reinforcement comprises
5 a fourth material.

1 8. The structure of claim 7 further comprising a third
2 metal interconnect disposed in the third material, the third
3 metal interconnect having a line portion and at least one
4 via portion, the third material deposited on at least the
5 line and via portions of the first metal interconnect, the
6 third metal interconnect in electrical contact with the
7 first metal interconnect and wherein the second

1 reinforcement is in contact with the third metal
2 interconnect.

1 9. The structure of claim 7 wherein the second
2 reinforcement is in contact with the via portion of the
3 anode section of the first metal interconnect.

1 10. The structure of claim 8 wherein the second
2 reinforcement is in contact with the third metal
3 interconnect.

1 11. The structure of claim 1 wherein the first
2 reinforcement is in contact with the via portion in the
3 anode section of the first metal interconnect and the length
4 of first reinforcement is at most 50% of the length of the
5 first metal interconnect.

1 12. The structure of claim 10 wherein the first
2 reinforcement is in contact with the via portion in the
3 anode section of the first metal interconnect and the length
4 of the first reinforcement is at most 50% of the length of
5 the first metal interconnect and wherein the length of the
6 second reinforcement is at most 50% of the length of the
7 first metal interconnect.

1 13. The structure of claim 7 wherein the second and
2 fourth materials are substantially the same.

1 14. The structure of claim 7 wherein the first third,
2 and fifth materials are substantially the same.

1 15. The structure of claim 7 wherein the first, third
2 and fifth materials are selected from the group consisting
3 of polyimide, parylene, polytetrafluoroethylene, SiLK™ and
4 Cyclotene™, Black Diamond™, silicon-containing organic
5 dielectric materials such as benzocyclobutene,
6 hydrogen/alkane-SQ family material such as HSQ or MSQ
7 (methyl sesquisiloxanes), nano-pore containing materials,
8 and air gaps.

1 16. The structure of claim 7 wherein the second and
2 fourth materials are selected from the group consisting of
3 silicon dioxide, fluoro-silicate glass, silicon nitride,
4 silicon oxynitride (SiO_xN_y) and diamondlike carbon.

1 17. A reinforced interconnect structure, comprising:
2 First, second and third metal interconnects, each of
3 the first, second and third interconnects disposed in a
4 mechanically compliant dielectric, each of the first, second
5 and third interconnects have a line portion and a via
6 portion, each of the line portions of the first, second and
7 third interconnects having a top and a bottom, each of the
8 first, second and third interconnects having an anode
9 section and a cathode section, wherein the via portion of
10 the second metal interconnect is in electrical communication
11 with the line portion of the first metal interconnection and
12 wherein the third interconnect is in electrical
13 communication with the second interconnect;

14 first and second reinforcements, each of the first and
15 second reinforcements comprising a mechanically rigid
16 material, the first reinforcement in contact with the via
17 portion in the anode section of the second metal

1 interconnect and the top of the line portion of the first
2 interconnect, the second reinforcement in contact with the
3 top of the line portion in the anode section of the second
4 interconnect and the bottom of the line portion of third
5 interconnect.

1 18. A reinforced interconnect structure, comprising:

2 First, second and third metal interconnects, each of
3 the first, second and third interconnects disposed in a
4 mechanically compliant dielectric, each of the first, second
5 and third interconnects have a line portion and a via
6 portion, each of the line portions of the first, second and
7 third interconnects having a top and a bottom, each of the
8 first, second and third interconnects having an anode
9 section and a cathode section, wherein the via portion of
10 the second metal interconnect is in electrical communication
11 with the line portion of the first metal interconnection and
12 wherein the third interconnect is in electrical
13 communication with the second interconnect;

14 first and second reinforcements, each of the first and
15 second reinforcements comprising a mechanically rigid
16 material, the first reinforcement positioned in the
17 dielectric between the first and second interconnects and
18 the second reinforcement positioned in the dielectric
19 between the second and the third interconnects.
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